2002 ANNUAL REPORT

FOREST Health IN ALBERTA

103-05982/

2002 ANNUAL REPORT

FOREST Health IN ALBERTA

Alberta
SUSTAINABLE RESOURCE DEVELOPMENT

Copyright © Her Majesty the Queen in Right of Alberta, 2002

ISSN 1480-5685

This publication is available at no charge from:

Alberta Sustainable Resource Development
Land and Forest Division
Forest Management Branch
Forest Health Section
9th Floor, Great West Life Building
9920 – 108 Street
Edmonton, Alberta T5K 2M4

Visit the Forest Health Website at: http://www3.gov.ab.ca/srd/forests/health/

Forest Health Vision

A healthy, sustainable forest landscape that fulfils the social, economic and environmental aspirations of all Albertans.

This report has been printed on Canadian recycled paper.

CONTENTS

FIGURES iii

TABLES iii

ACKNOWLEDGEMENTS v

SUMMARY vii

INTRODUCTION 1

INSECT AND DISEASE CONDITIONS IN 2002 AND PREDICTIONS FOR 2003 3

CONIFER PESTS 3

Spruce Budworm, *Choristoneura fumiferana* (Clemens) 3

Aerial Surveys on Defoliation 3

Northeast Corporate Region 4

Northwest Corporate Region 4

Southwest Corporate Region 6

Forecast for 2003 Based on Pheromone Trap Catches in 2002 6

Northeast Corporate Region 8

Northwest Corporate Region 8

Southwest Corporate Region 10

Forecast for 2003 Based on Second-instar Larval Survey Results in 2002 11

Mountain Pine Beetle, *Dendroctonus ponderosae* Hopkins 13

Aerial Overview Surveys 13

Banff National Park 13

Jasper National Park 16

Provincial Parks 16

Ground Surveys 16

Survey with Pheromones 18

Prevention of Mountain Pine Beetle: Restrictions on Movement of Pine Logs and Products 18

Spruce Beetle, *Dendroctonus rufipennis* (Kirby) 19

Yellowheaded Spruce Sawfly, *Pikonema alaskensis* (Rohwer) 19

BROADLEAF PESTS 20

Large Aspen Tortrix, *Choristoneura conflictana* (Walker) 20

Northeast Corporate Region 20

Northwest Corporate Region 22

Southwest Corporate Region 22

Forest Tent Caterpillar, *Malacasoma disstria* Hübner 22

Gypsy Moth, *Lymantria dispar* (Linnaeus) 22

Smaller European Elm Bark Beetle, *Scolytus multistriatus* (Marsham) 23

OTHER NOTEWORTHY PESTS 23

Dutch Elm Disease (DED), *Ophiostoma ulmi* (Buis.) Nannf. and *O. novo-ulmi* Brasier 23

Dothiorella Wilt Disease of Elm, *Dothiorella ulmi* Verall and May 23

Gray Willow Leaf Beetle, *Tricholochmaea decora* (Say) 24

Ash Leaf Cone Caterpillar, *Caloptila fraxinella* (Ely) 24

Red Elm Weevil, *Magdalis armicollis* (Say) 24

INVASIVE PLANT MANAGEMENT 25

PROVINCIAL 25

REGIONAL 25

Northeast Corporate Region 25

Education, Awareness and Co-operative Initiatives 25

Surveys and Control 25

Northwest Corporate Region 26
Education, Awareness and Co-operative Initiatives 26
Surveys and Control 27
Southwest Corporate Region (SW1 & SW2 Areas) 27
Education, Awareness and Co-operative Initiatives 27
Surveys and Control 28
Southwest Corporate Region (SW3 & SW4 Areas) 30
Education, Awareness and Co-operative Initiatives 30
Surveys and Control 30

INCREASED AWARENESS AND TRAINING 31
PROVINCIAL 31
Increased Awareness 31
Bugs and Disease Newsletter 31
Forest Health Website 31
Posters and Brochures 31
Highway Signs 31
Forest Pest Damage Diagnostic System 32

RESEARCH AND DEVELOPMENT 33
FIELD TRIALS 33
Wood Borer Study 33

REFERENCES 35

APPENDIXES 37
I ALBERTA TOWNSHIP SYSTEM 37
II INFORMATION ON OPERATIONAL USE OF PHEROMONES IN ALBERTA, 2002 38

FIGURES

1. Corporate regions and corporate areas for forestry in Alberta, 2002 2
2. Spruce budworm-defoliated areas in 2002, compared to the budworm-defoliated areas in 2001 in the Northeast Corporate Region, Alberta 5
3. Spruce budworm-defoliated areas in 2002, compared to the budworm-defoliated areas in 2001 in the Northwest Corporate Region, Alberta 7
4. Forecast on the risk of spruce budworm outbreaks occurring in 2003, based on the moth catches in pheromone-baited traps in 2002, Alberta 9
5. Forecast on spruce budworm defoliation severity in the Northwest Corporate Region in 2003, based on the second-instar larval counts in 2002 12
6. Mountain pine beetle infestations and occurrence of beetle-hits in pheromone-baited plots in 2002, Alberta 14
7. Number of mountain pine beetle-affected trees in Banff National Park, 1998 – 2002 15
8. Estimated mountain pine beetle infested areas based on the ground survey results in Canmore area of Alberta, 2002 17
9. The results of aspen pest defoliation surveys in Alberta, 2002 21

TABLES

1. The extent of spruce budworm-defoliated areas in 2001 vs. 2002 in Alberta 3
2. The results of the 2002 spruce budworm moth survey with pheromone-baited traps in the Northwest Corporate Region of Alberta 10
3. The results of aspen pest defoliation surveys in Alberta, 2001 vs. 2002 20

NOTE: *The mention of certain products does not necessarily imply their endorsements, nor does the exclusion of other products necessarily imply their disapproval by Alberta Sustainable Resource Development.*

ACKNOWLEDGEMENTS

Sunil Ranasinghe, Forest Entomologist of Alberta Sustainable Resource Development, Land and Forest Division, compiled this report. It is based on the annual reports submitted by the Regional Forest Health Officers: Tom Hutchison (Northeast Corporate Region), Daniel Lux (Southwest Corporate Region), Mike Maximchuk (Northwest Corporate Region), and Erica Mueller (Southwest Corporate Region). Mike Undershultz, Forest Health Officer (Forest Health Section) provided the details about the provincial invasive plant (noxious and restricted weeds) program. Christine Kominek, Forest Health Officer, and Cody Crocker, Data Management Technologist (Forest Health Section) finalized the forest health data and pest distribution maps presented in this document.

Janet Feddes-Calpas of Alberta Agriculture, Food and Rural Development, provided an update on Dutch elm disease. Christopher Saunders, an entomologist with the Community Services of the City of Edmonton, provided information on urban forest pests.

Most of the field survey data reported here were collected, under the direction of the Regional Forest Health Officers, by Land and Forest Division staff and summer crews working in the forest areas.

The industry support and participation in the 2002 Forest Health Program is gratefully acknowledged. The industry supported the forest pest survey programs, participated in invasive plant management programs, supported the forest health training programs and attended the regional and provincial forest health meetings (IPM groups). Alberta-Pacific Forest Industries (Dave Fox and Chris Kemble), Millar Western Industries Ltd. (Jeff Scammel), Buchanan Lumber Ltd., and Manning Diversified Forest Products supported the 2002 moth-trapping programs. Tolko-High Level Lumber Division provided funding for the spruce budworm second-instar surveys in the Northwest Corporate Region. Ace Vegetation (Ian McDonald) and Target Vegetation Control (Glen Richards) actively supported the invasive plant program in the Northeast Corporate Region. Weldwood of Canada Ltd. assisted with the mountain pine beetle control program in the Southwest Corporate Region. Canadian Forest Service and Phero Tech Inc. personnel participated in training programs aimed at increasing awareness in forest health. St. Jean Lumber and Millar Western Forest Industries helped with the field trial on wood borer damage.

SUMMARY

This annual report provides details about forest insect pests, diseases, and invasive plants (noxious and restricted weeds) that occurred in Alberta in 2002. Reported here are the results of the aerial and ground surveys of pest infestations; invasive plant management programs; training and increased awareness on forest health issues; and research and development carried out under the Forest Health Program of Alberta Sustainable Resource Development (SRD).

Given below is a summary of the extent of major forest pest infestations surveyed in 2002:

Pest Species	Extent of Infestation
Spruce budworm	159 456 ha Net area
	23 658 ha Gross area
Mountain pine beetle	1900 trees killed and an estimated 9000 trees infested in Banff National Park 200 trees killed and 1100 trees infested in provincial parks and protected areas 115 infested trees within municipal and private lands
Aspen defoliators	4 199 609 ha Gross area

In 2002, the spruce budworm, *Choristoneura fumiferana* (Clem.) defoliated area in Alberta increased substantially compared to the area defoliated in 2001. An estimated 159 456 ha within the inventoried forest area had moderate or severe spruce budworm defoliation in 2002, compared to the 93 649 ha similarly defoliated in 2001. In addition, spruce budworm defoliation was observed over a gross area of 23 658 ha in the non-inventoried forest stands. The results of spruce budworm moth survey plots forecast moderate to high risk of new outbreaks occurring in 2003 in the Northeast Corporate Region, especially in the Waterways Area; risk is mostly low in the Northwest Corporate Region except in the Upper Hay Corporate Area. The risk of two-year cycle budworm outbreaks occurring in 2003 is low in the Southwest Corporate Region. A limited second-instar larval survey carried out in the Northwest Corporate Region predicted high probability of severe spruce budworm defoliation occurring in the surveyed areas in 2003.

In 2002, the mountain pine beetle, *Dendroctonus ponderosae* Hopkins, populations increased four- to five-fold in the infested areas in Banff National Park. Up to 9000 beetle-infested trees are expected to be killed in this park in 2003. The park authorities have initiated programs for habitat change that will also help to manage the beetle infestations. The beetle populations in Jasper National Park remained low in 2002. However, the south-facing slopes in Jasper National Park are at risk of mountain pine beetle infestations in 2003. During aerial overview surveys in the Southwest Corporate Region red-attacked trees were found in Willmore Wilderness Park; green-attack trees were detected in this park during a follow-up ground survey. Ground surveys were carried out in and around Canmore following reports of lodgepole pine trees with red crowns in this area. Nearly 800 beetle-attacked trees were detected during these surveys. Most

of the pheromone-baited trees in the Southern Rockies Area and in Willmore Wilderness Park had beetle-hits. The SRD is working in collaboration with the Department of Community Development to manage the mountain pine beetle infestations in the "forested Crown land" of the province.

Spruce beetle, *D. rufipennis* (Kirby) and yellowheaded spruce sawfly, *Pikonema alaskensis* (Rohwer), infestations were reported in 2002 from the Northeast Corporate Region.

The large aspen tortrix (LAT), *C. conflictana* (Walker), defoliation was observed over a gross area of about 4.2 million ha in 2002. This included 127 000 ha of a new infested area in the Northeast Corporate Region. The forest tent caterpillar, *Malacosoma disstria* Hübner, defoliation was indistinguishable from the predominant large aspen tortrix-defoliation where overlapping populations of these two species were observed. No gypsy moths were trapped in 2002 under the SRD's gypsy moth monitoring program.

The smaller European elm bark beetle (SEEBB), one of the vector species of Dutch elm disease (DED), continued to be trapped at many locations in the non-forested area of the province. The number of SEEBB trapped in the province declined in 2002 compared to 2001. Alberta still remains free of DED. However, there were many incidences of a similar vascular wilt disease, *Dothiorella ulmi*, affecting elm trees in the City of Edmonton.

The gray willow leaf beetle, *Tricholochmaea decora* (Say), damage was extensive in the Northeast Corporate Region. Ash leaf cone caterpillar, *Caloptila fraxinella*, damaged ash trees at a few locations in the Northeast Corporate Region. The red elm weevil, *Magdalis armicollis* (Say), damaged some elm trees in southern Alberta.

In 2002, the provincial invasive plant management focussed on landscape level programs launched in co-operation with industry- and public-sector stakeholders. Corporate area based co-operative invasive plant management groups were established under this initiative. The regional invasive plant management programs included inventory work, education and increased awareness, and control.

The Forest Health Section (FHS) increased forest health awareness and provided training through a newsletter, pamphlets, posters and workshops. A poster and a pamphlet to increase public awareness of the mountain pine beetle were published during 2002. The Forest Pest Damage Diagnostic System was re-evaluated. It is being modified to be a web-based system of pest identification.

A two-year field trial was established in the Northeast Corporate Region to compare the impact of wood borers vs. checking in the fire-killed timber.

INTRODUCTION

This is a report on forest insect and disease conditions in 2002 and the forecast on major forest pest conditions in 2003, in Alberta. Reported as well are the details of invasive plant (noxious or restricted weed) management in the forested area (forested Crown land) of the province. In addition, other forest health-related programs aimed at increasing awareness, training, technology transfer, and research and development are described in this report.

The Forest Health Section of the Department of Sustainable Resource Development (SRD) is responsible for addressing forest health concerns within the "forested Crown land" of the province. This forested Crown land is administered by 10 corporate areas located within three corporate regions (Figure 1)[1].

In 2002, the spruce budworm, mountain pine beetle and aspen defoliators were the major pests that were monitored in the province. This report does not contain details about some other major pests such as lodgepole pine dwarf mistletoe, rusts and canker causing diseases, stem and root decays including Armillaria root disease. The details of minor defoliators and wood borers are not mentioned in this report unless there were local outbreaks of these pests in 2002. These pests are not routinely monitored on an annual basis and no quantitative information on their annual occurrences is available.

In Alberta, legal land descriptions based on Alberta Township System are used to describe any given parcel of land in the province. Under this system, land is designated as being west of the 4th Meridian (longitude 110° west), the 5th Meridian (longitude 114° west) or the 6th Meridian (longitude 118° west). Between these meridians are six-mile-wide columns called ranges, numbered consecutively from east to west. Townships are six-mile-wide rows that intersect the ranges. The townships are numbered consecutively from the southern border along Montana to the northern border along the Northwest Territories. Each township is divided into 36 one-square mile sections, e.g., 1 – 87 – 18 – W4 refers to section 1 of township 87 and range 18 west of the fourth meridian. The layout of these townships and ranges in Alberta is shown in Appendix I.

[1] Before 2002, the forest administration units were known as forest areas and were organized into four Regions: Northwest Boreal Region, Northeast Boreal Region, Northern East Slopes Region and Parkland Bow Prairie Region.

Figure 1. Corporate regions and corporate areas for forestry in Alberta, 2002.

INSECT AND DISEASE CONDITIONS IN 2002 AND PREDICTIONS FOR 2003

CONIFER PESTS

SPRUCE BUDWORM, *Choristoneura fumiferana* (Clemens)

Aerial Surveys on Defoliation

Aerial surveys were carried out in 2002 to estimate the severity and extent of spruce budworm-defoliation in forest stands in Alberta. The procedure used for these surveys is described in the "Forest Health Aerial Survey Manual" (Ranasinghe and Kominek, 1999). The severity of spruce budworm defoliation was rated either as moderate (35% to 70% defoliation) or severe (over 70% defoliation) because it is difficult to observe light defoliation (i.e., less than 35% defoliation) from the air. The extent of the budworm-defoliated areas by severity categories is shown in Table 1.

Table 1. The extent of spruce budworm-defoliated areas in 2001 vs. 2002 in Alberta

CORPORATE REGION	AREA	DEFOLIATED AREA (ha)				REMARKS
		2001		2002		
		Moderate	Severe	Moderate	Severe	
Northwest	Upper Hay	9236	56 788	13 764	82 085	Net area
	Peace	0	12 572	560	15 022	Net area
Northeast	South of lat. 58°[a]	14 142	911	35 108	12 917	Net area
				6500		Gross area
	North of lat. 58°[b]	3321	18 602	2438	14 720	Gross area
TOTAL		22 378	70 271	49 432	110 024	Net Area
		3221	18602	8938	14 720	Gross Area

[a] Athabasca Area and part of Waterways Area

[b] Part of Waterways Area

Northeast Corporate Region

An aerial overview survey was conducted from July 2-3, 2002, along the major river drainages to estimate the extent and severity of budworm defoliation in this corporate region. A fixed-wing aircraft (Cessna 206) was used for this survey. The data collected during these surveys were supplemented by information collected during broadleaf defoliator overview surveys carried out in late July. Alberta Vegetation Inventory (AVI) data were used to calculate the net defoliated area with spruce dominance in Alberta Pacific Forest Industries' Forest Management Area (Alpac FMA). The extent of regional spruce budworm defoliation by severity categories is shown in Table 1. The spruce budworm-defoliated areas in this corporate region are shown in Figure 2.

In the Northeast Corporate Region, the spruce budworm defoliated an estimated net area of 48 025 ha south of latitude 58° N, i.e., an area for which Alberta Vegetation Inventory (AVI) coverage is available. The net defoliated area in 2002 is a dramatic 219 % increase compared to the 15 053 ha defoliated in the corresponding area in 2001. Severe budworm defoliation was observed on 12 917 ha (26.9% of the defoliated area) and moderate defoliation was observed on 35 108 ha (73.1% of the defoliated area), as shown in Table 1. In addition, the spruce budworm defoliated a gross area of 6500 ha in the Forestry Management Unit A10 south of latitude 58° N. This area does not have AVI coverage. Most of the spruce budworm defoliation in areas south of latitude 58° N was in conifer-dominant forest stands. Within the Alpac FMA, spruce budworm severely defoliated 2886 ha located in township 99, ranges 10 and 11 and northwest of McClelland Lake. Another large patch of 11 877 ha in townships 96-98 and ranges 11-13 were severely defoliated by the spruce budworm in 2002. Significant areas of moderate to severe spruce budworm defoliation were observed along Christina and Clearwater river drainages. These areas had very high spruce budworm moth counts during the last two years but this is the first year where defoliation was visible from the air.

Only the gross figures of spruce budworm defoliation are reported for the area north of latitude 58° N because forest inventory data are not available for this area. In 2002, the total gross defoliated area north of latitude 58° N was 17 158 ha. This is a 21.7% drop compared to the gross defoliated area reported in 2001. Most of this area (85.8%) had severe defoliation. For the third year in a row, spruce budworm defoliated a large area at the confluence of the Peace and Slave rivers within Wood Buffalo National Park. This defoliation is estimated to be 12 710 ha; nearly 86% of this defoliation was severe. Another 2385 ha of severe budworm defoliation was identified further west along the Peace River.

Northwest Corporate Region

An aerial survey to detect spruce budworm defoliation was carried out in this corporate region between July 16 and August 9, 2002. A fixed-wing aircraft (Cessna 210) was used for this general overview survey. The budworm-defoliated areas in the Northwest Corporate Region are shown in Figure 3.

In 2002, the spruce budworm defoliated an estimated 111 431 ha in the NW Corporate Region. This is a 41.7% increase compared to the 78 596 ha defoliated in this corporate region by the

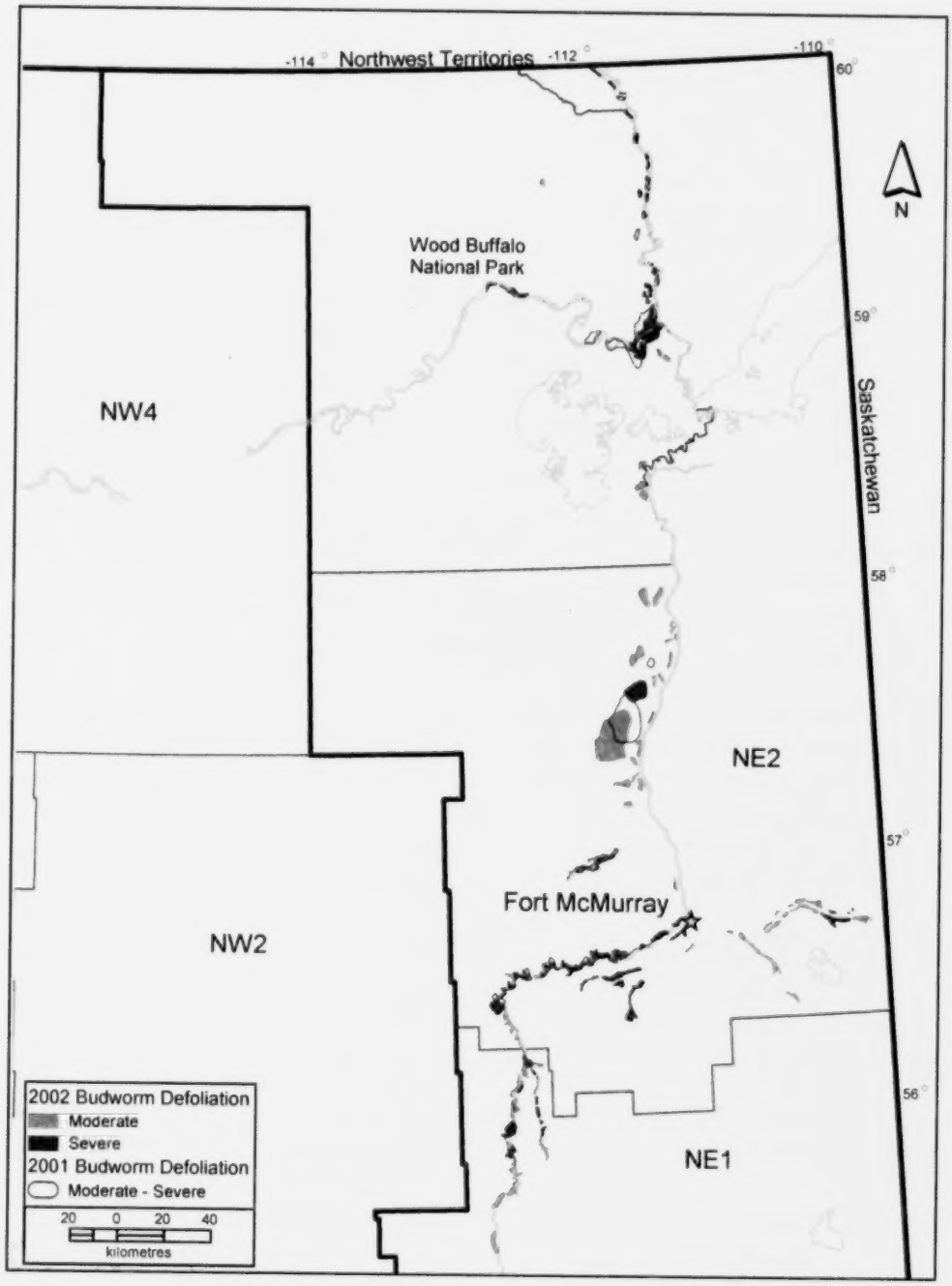


Figure 2. Spruce budworm-defoliated areas in 2002, compared to the budworm-defoliated areas in 2001 in the Northeast Corporate Region, Alberta.

spruce budworm in 2001. As predicted in 2001, the proportion of the severely defoliated area remained about the same. Altogether, the spruce budworm severely defoliated 97 107 ha (87.2%) of the affected host stands in this Corporate Region in 2002. In comparison, 88% of the affected area was severely defoliated in 2001. Correspondingly, the moderately defoliated area remained about 12% of the affected area in 2002.

In the Upper Hay Corporate Area, the spruce budworm defoliated an estimated 95 849 ha in 2002 compared to 66 024 ha defoliated in 2000. This is a 45.2% increase in the defoliated area. An estimated 82 085 ha (86%) of the affected area in 2002 were severely defoliated and 13 764 ha (14%) were moderately defoliated. In comparison, 88% of the affected area was severely defoliated and 12% of the affected area was moderately defoliated in 2001.

In the Upper Hay Corporate Area, new areas of budworm defoliation were detected in 2002 near the confluence of Wabasca and Peace rivers; near the confluence of Mikkwa and Peace rivers; and along the western border of Wood Buffalo National Park south as well as north of the Peace River. Compared to 2001, defoliated areas increased significantly in 2002 along Sousa creeks; Chinchaga River; Yates River; Zama City; north of Paddle Prairie Metis Settlement; and John D'or Prairie Indian Resere. In addition there were unconfirmed reports of spruce budworm defoliation along the Buffalo Creek and Buffalo Lake, located northeast of Wabasca near Livock Fire Lookout Tower.

In the Peace Corporate Area, the spruce budworm defoliated an estimated 15 582 ha in 2002. This is a 24% increase compared to the 12 572 ha defoliated in 2001. This defoliation was severe over 15 022 ha (96.4%) and moderate over 560 ha. In this Area, new budworm defoliation was detected in Notikewin Provincial Park along the Peace River. Spruce budworm defoliation re-surged at the Hawk Hills community wood lot after a three-year absence. Defoliation within the Paddle Prairie Metis Settlement increased in 2002 compared to 2001.

Southwest Corporate Region

There was no budworm defoliation visible from the air during the aerial surveys carried out in 2002. However, there were ground observations that confirmed spruce budworm defoliation at the west end of Upper Kananaskis Lake; in addition there were unconfirmed reports of white spruce and sub-alpine fir defoliation in Banff National Park and near Howse Pass. These are most likely caused by the two-year cycle spruce budworm, *C. biennis* Free.

Forecast for 2003 Based on Pheromone Trap Catches in 2002

The spruce budworm moth populations in several forest stands located across the forested Crown land were monitored to forecast the risk of spruce budworm outbreaks occurring in 2003. These stands were either budworm-defoliated or considered to be at high risk of being defoliated by the spruce budworm in the near future. Multi-Pher I® traps (Le Groupe Biocontrole, Quebec) baited with female sex pheromone lures (Biolure®, Consep Membranes Inc., USA) were used to monitor the spruce budworm male moth populations. The monitoring procedure is described in the "Spruce Budworm Management Guide" (Ranasinghe and Kominek, 1998).

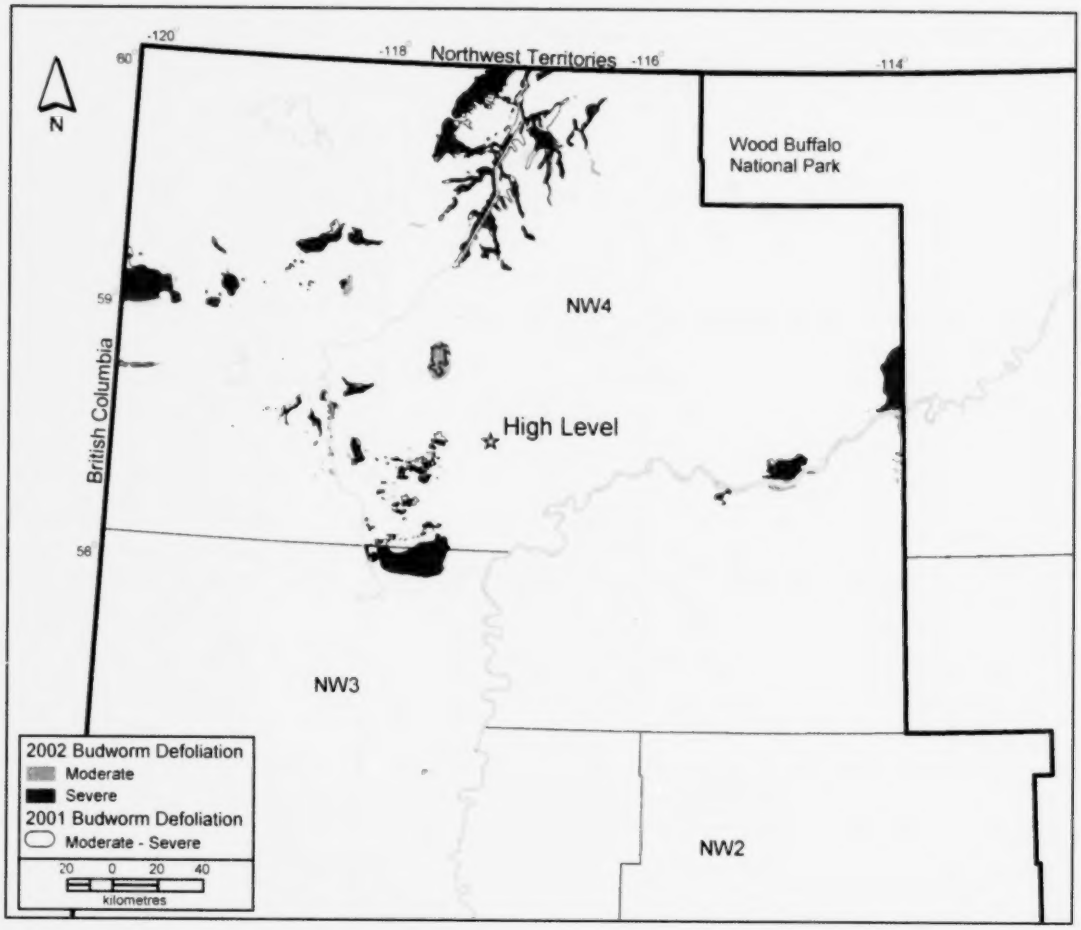


Figure 3. Spruce budworm-defoliated areas in 2002, compared to the budworm-defoliated areas in 2001 in the Northwest Corporate Region, Alberta.

One hundred and fifty plots were established across the province to monitor the spruce budworm moths. At three of these plots both traps were disturbed and were excluded from further consideration. The forecast based on the results from the other 147 plots is shown in Figure 4.

Northeast Corporate Region

In the NE Corporate Region, 49 plots were established as follows in the corporate areas of Lac La Biche (27) and Waterways (22). At two of these plots both traps were disturbed. The forecast based on catches from 47 of these plots is shown in Figure 4. Overall, the trap counts in 2002 were relatively higher than the trap counts in 2001.

In the Lac La Biche Area, the average trap catches indicated that the risk of outbreaks occurring in 2003 is low in nine plots (36%), moderate in 13 plots (52%) and high in three plots (12%). All except one of the plots with low outbreak risk were located south of township 71. These low outbreak risk plots had average catches ranging from 20 to 478 moths per trap. The 13 plots with moderate outbreak risk (range: 505 to 1587 moths per trap) and the three plots with high outbreak risk (range: 2254 to 4539 moths per trap) were located north of township 71. One plot located north of McMillan Lake (township 76 and range 16) had an exceedingly high average count of 4539 moths per trap. This area, with a high risk of having a new spruce budworm outbreak in 2003, has to be monitored closely.

In the Waterways Area, pheromone trap catches indicated that the risk of spruce budworm outbreaks occurring in 2003 is moderate (547 to 1806 moths per trap) in 13 plots (59%) and high (2064 to 4459 moths per trap) in nine plots (41%). The plot with an average trap catch of 4459 moths was located just north of Fort McMurray (township 90 and range 9); this plot needs closer monitoring in 2003 although no defoliation was visible in this area in 2002.

Overall, the risk of spruce budworm outbreaks occurring has been increasing in the Northeast Corporate Region during the last four years. This is particularly true in the Waterways Forest Area where most of the current spruce budworm outbreaks are found.

Northwest Corporate Region

In the NW Corporate Region, 70 plots were established as follows in the corporate areas of Lesser Slave (17); Peace (21); Smoky (9) and Upper Hay (23). In the Lesser Slave Area both traps were disturbed in one plot that was dropped from consideration. The results of the remaining 69 plots are summarized in Table 2. The forecast based on these results is shown in Figure 4.

The risk of budworm outbreaks occurring in 2003 is low in the corporate areas of Peace (13 to 409 moths per trap) and Smoky (9 to 471 moths per trap). Historically, there has been a low risk of spruce budworm outbreaks occurring in these areas.

The risk of spruce budworm outbreaks occurring in 2003 is low to moderate in the Lesser Slave Area. In this area, the risk of outbreaks occurring in 2003 is low in 11 plots (69%) and moderate in five plots (31%).

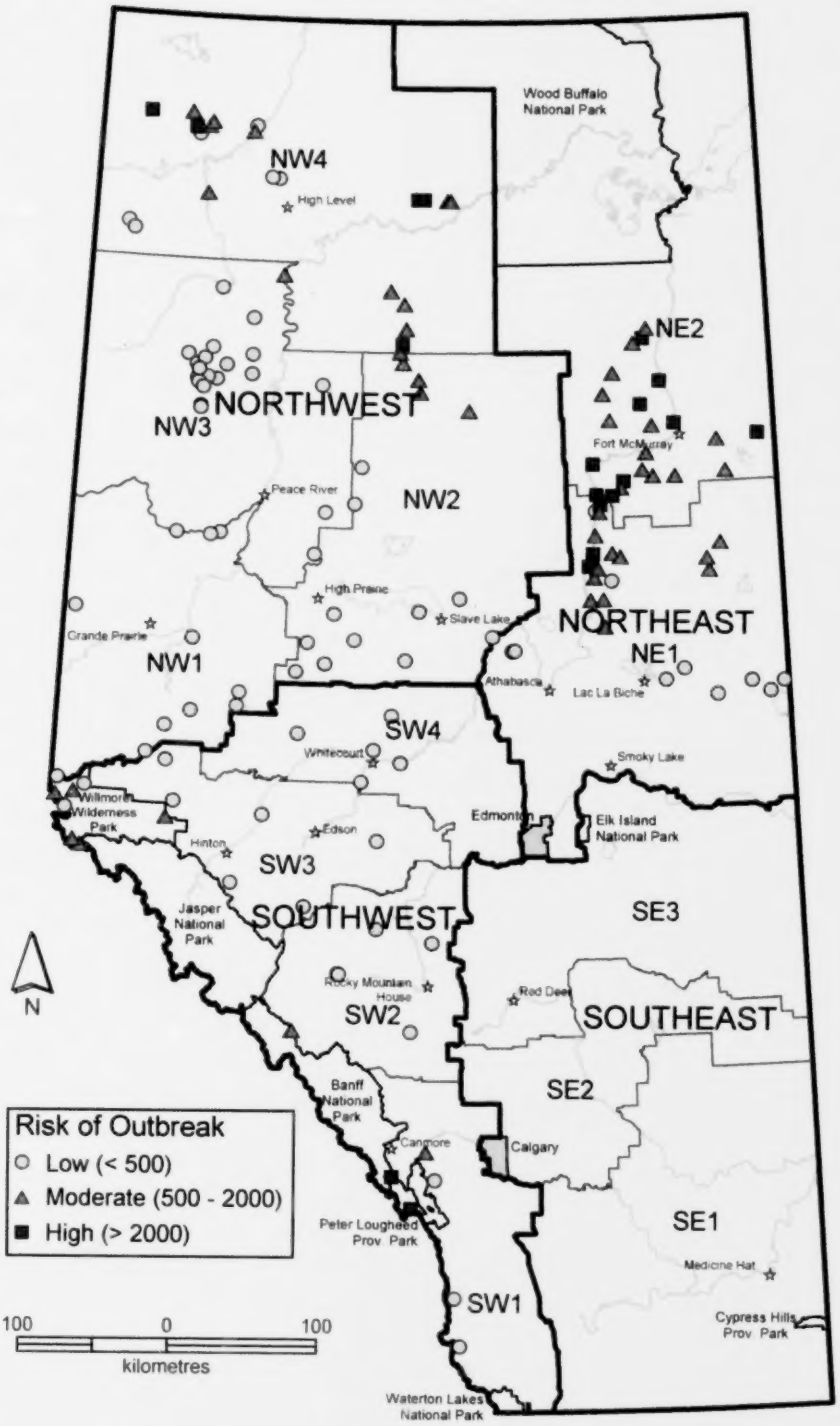


Figure 4. Forecast of the risk of spruce budworm outbreaks occurring in 2003, based on the moth catches in pheromone-baited traps in 2002, Alberta.

In the Upper Hay Corporate Area, the risk of new spruce budworm outbreaks occurring in 2003 is low in six plots (26%), moderate in 12 plots (52%) and high in five plots (22%). This is the only corporate area in this corporate region to have plots with high risk of outbreaks occurring in 2003.

Table 2. The results of the 2002 spruce budworm moth survey with pheromone-baited traps in the Northwest Corporate Region of Alberta

		AREA			
RISK CATEGORY		**Lesser Slave**	**Peace**	**Smoky**	**Upper Hay**
LOW	**No. of plots per category**	11	21	9	6
	Percent of plots per category	69%	100%	100%	26%
	Min/Max avg. count in plots	8/261	13/409	9/471	56/416
MODERATE	**No. of plots per category**	5	0	0	12
	Percent of plots per category	31%	0%	0%	52%
	Min/Max avg. count in plots	797/1977	--------	-------	587/1999
HIGH	**No. of plots per category**	0	0	0	5
	Percent of plots per category	0%	0%	0%	22%
	Min/Max avg. count in plots	--------	-------	-------	2002/2790

Out of the plots with high risk of outbreaks occurring in 2003, two were located near the Lawrence River, one plot was located south of Tall Creek along the Wabasca River and the other two plots were located in the Zama City area. Compared to the trap catches in the plots in 2001, the pheromone plots established north of Red Earth along the Wabasca River showed the biggest increase in trap catches in 2002. In 2001, the average trap count in this area was 692.29 moth per trap. In 2002, the average trap catch increased to 1485 moths per trap. This is a cause for concern because drainage along the Wabasca River had a severe spruce budworm outbreak in the 1960s.

Overall, compared to 2002, the risk of new spruce budworm outbreaks occurring in 2003 appears to have been reduced in the Northwest Corporate Region.

Southwest Corporate Region

In the Southwest Corporate Region, 31 plots were established as follows to monitor the spruce budworm moth populations: Southern Rockies (6); Clearwater (6); Foothills (14); and Woodlands (5). The forecast based on the results of these plots is shown in Figure 4.

In the Southern Rockies Corporate Area, the risk of new outbreaks occurring in 2003 was low (94 to 370 moths per trap) in three plots (50%), moderate (1090 moths per trap) in one plot (17%) and high (2350 to 2790 moths per trap) in two plots (33%). The plots with high outbreak risk were located in township 22 range 10 and in township 19 range 9. Preliminary indications are that the trap catches in these two plots are those of the two-year cycle budworm *Choristoneura biennis* Free. Consequently, high budworm catches are expected at these plots in 2004.

In the Clearwater Corporate Area, the risk of spruce budworm outbreaks occurring in 2003 is low in five plots (average count of 53 to 218 moths per trap) and moderate in one plot (average count of 1983 moths per trap).

In the Foothills Corporate Area, the average trap catches increased in 2002 compared to the trap catches in 2001. This area has the two-year cycle budworm, and the trap catches have been alternating between high and low numbers in consecutive years. Consequently, the trap catches of the two-year cycle budworm moths in a given year predict the risk of an outbreak occurring two years later. In Willmore Wilderness Park of this corporate area, the average trap catches indicated a low outbreak risk (211 to 421 moths per trap) in three plots and a moderate outbreak risk (510 to 1336 moths per trap) in five plots in 2004. However, the risk of an outbreak occurring in Willmore Wilderness Park in 2003 is low because relatively low trap catches were observed in 2001. The risk of an outbreak occurring outside Willmore Wilderness Park is low; the average trap catches in the six plots located outside the park varied from 82 to 273 moths per trap.

In the Woodlands Corporate Area, the average catches in the five plots ranged from 15 to 58 spruce budworm moths per trap. The risk of a spruce budworm outbreak occurring in 2003 is low in this corporate area.

Forecast for 2003 Based on Second-Instar Larval Survey Results in 2002

Second-instar (L2) larval surveys were carried out in the Northwest Corporate Region in and around forest stands that have been defoliated by the budworm during the current outbreak. The results of these surveys were used to forecast the severity of defoliation expected in 2003 in the areas surveyed. The survey procedures are described in the "Spruce Budworm Management Guide" (Ranasinghe and Kominek, 1998).

In the NW Corporate Region, 15 L2 plots were established in the Upper Hay Corporate Area. All the plots were located in unsprayed stands because there was no aerial spraying in 2002 to control the spruce budworm in Alberta. Seven of these plots were located in Shekelie River Area, another seven plots were located in the Cameron Hills west of Indian Cabins and the other plot was located along the Steen River. The results of this survey are shown in Figure 5.

Twelve plots (80%) had L2 counts that indicated severe spruce budworm defoliation in 2003. These included all seven plots located at Cameron Hills, the plot located at Steen River and four plots located at Shekelie River Area. Larval counts from two other plots located at Shekelie River Area indicated moderate defoliation; one of these plots had black spruce trees. The larval counts from the other plot at this location indicated light defoliation in 2003.

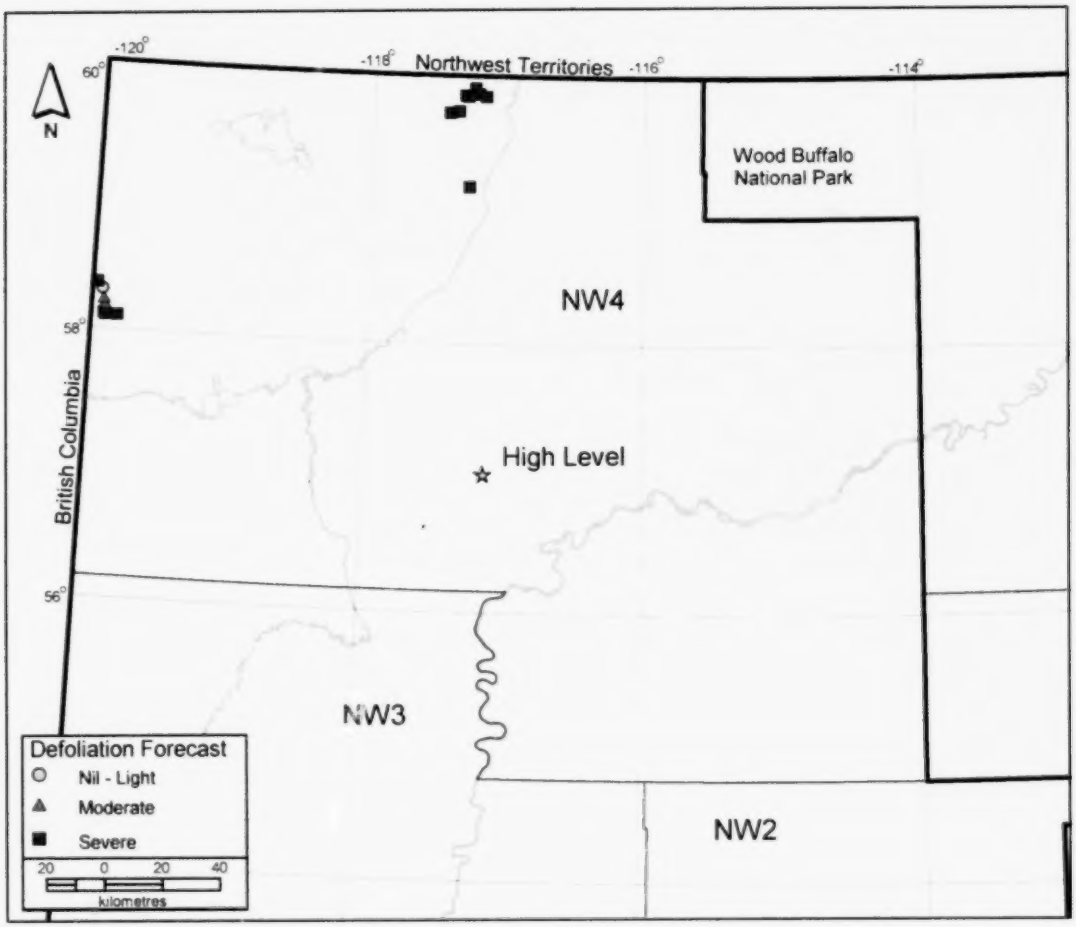


Figure 5. Forecast on spruce budworm defoliation severity in the Northwest Corporate Region in 2003, based on the second-instar larval counts in 2002.

MOUNTAIN PINE BEETLE, *Dedroctonus ponderosae* Hopkins

Aerial Overview Surveys

In the fall, the forested Crown land and national parks in southwestern Alberta were surveyed to detect mountain pine beetle (MPB) infestations. The Regional Forest Health Officers in the Southwest Corporate Region used rotary-wing aircraft for these surveys. The surveys mainly covered the river valleys in the foothills bordering B.C., Willmore Wilderness Park and Waterton National Park. Leo Unger (Pacific Forestry Centre, Canadian Forest Service) carried out an aerial survey over Banff and Jasper national parks.

No mountain pine beetle-killed trees were detected either in the forested Crown land or in Waterton National Park during these surveys.

Banff National Park

The MPB populations increased four to five fold in 2002 at the infested sites. Approximately 1900 new faders, i.e., lodgepole pines MPB-killed in 2001 and turning red colour in 2002, were mapped during an aerial overview survey of this park[2]. The number of estimated green-attack trees, i.e., current year attack where foliage of the infested trees still remain green, in the park is as follows: Brewster Creek (50); Healy Creek (1300-2000); Mount Norquay (800-1400); Tunnel Mountain (800-1500); and Fairholme Range (4000-6000). In 2002, the park authorities were planning to remove 2000 beetle-infested trees. In addition, another 1800 trees were to be burned in the infested areas[3].

A prescribed burn scheduled for 2003 and sanitation harvesting are expected to reduce the number of green-attack trees to about 1200 prior to beetle flight in 2003. However, if the current trend of population increase continues unabated, 5000 to 10 000 mature lodgepole pines are expected to be killed by the mountain pine beetle in Banff National Park in 2003[3]. Thus the mountain pine beetle outbreak in Banff National Park is increasing exponentially and appears to be in the epidemic phase (Figures 6 and 7).

[2] Leo Unger, Natural Resources Canada, Pacific Forestry Centre, 506 West Burnside Road, Victoria, B.C., personal communication

[3] Ian Pengelley, Vegetation Specialist, Banff National Park, Banff, Alberta, personal communication

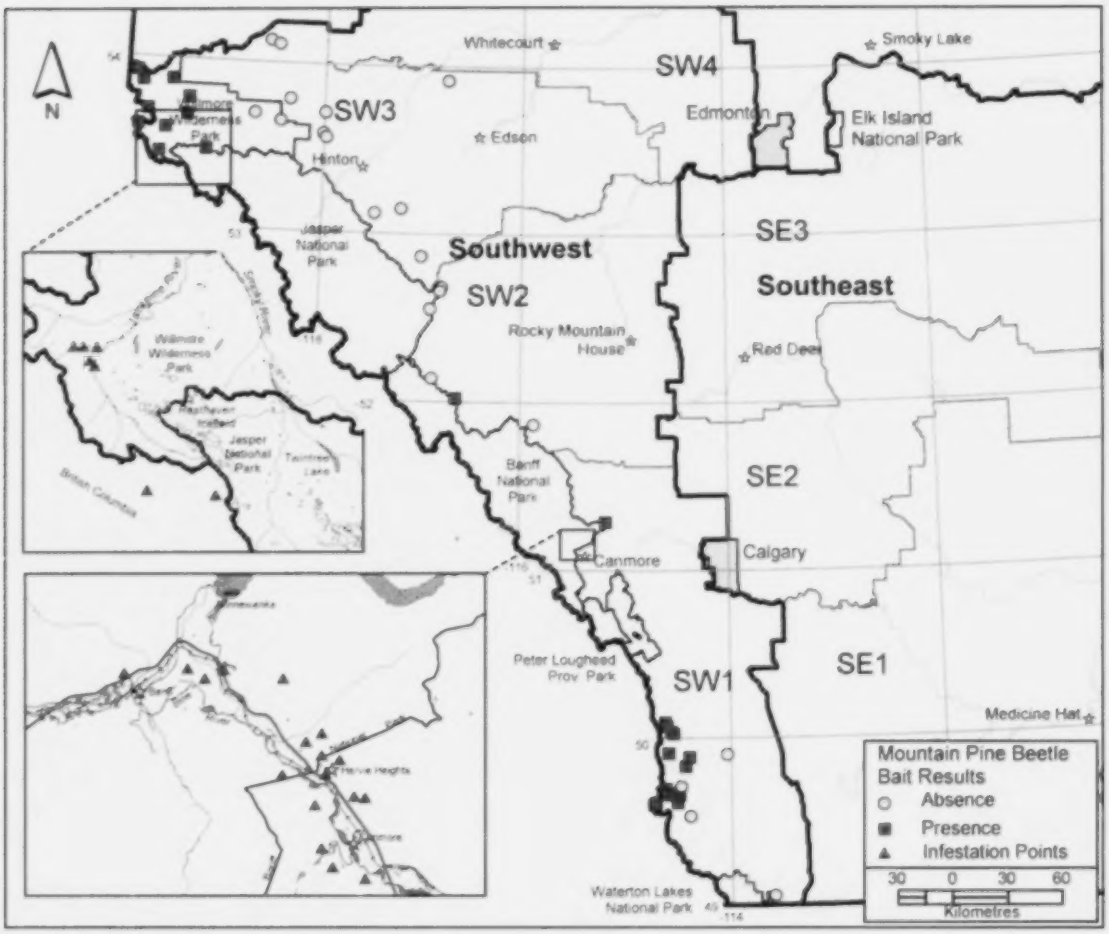


Figure 6. Mountain pine beetle infestations and occurrence of beetle-hits in pheromone-baited plots in 2002, Alberta.

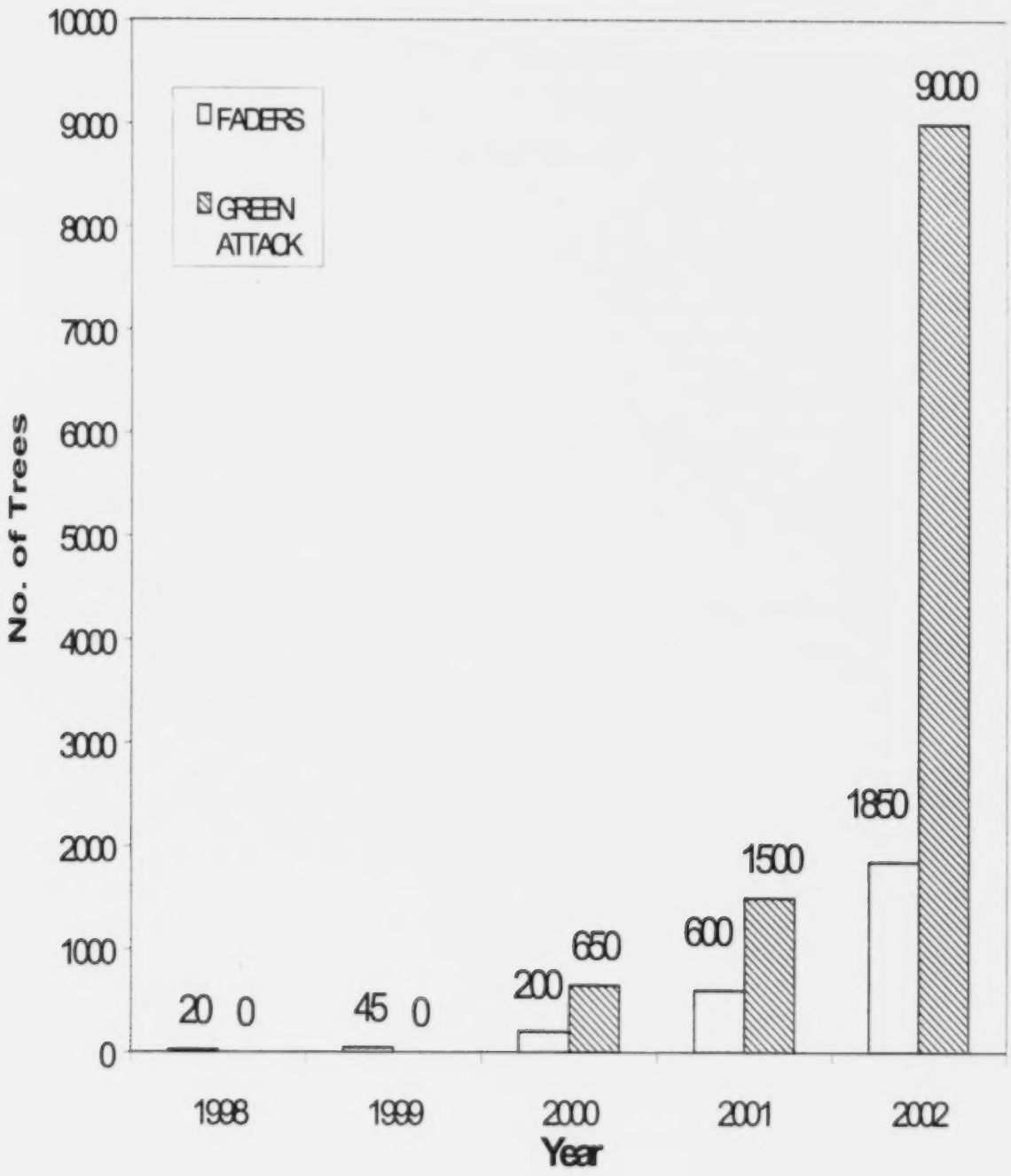


Figure 7. Number of mountain pine beetle-affected trees in Banff National Park, 1998-2002.

Jasper National Park

Mountain pine beetle was still present in the Smoky River area in 2002 but suffered high over-wintering mortality. Two MPB-killed trees were observed at the west park gate and a few faders were observed within this park. However, many beetle-killed trees were observed during aerial surveys between the western boundary of this park and Mount Robson Park in B.C.[4] These may trigger new beetle infestations on mature lodgepole pines on the south-facing slopes of Jasper National Park.

Provincial Parks

A substantial number of lodgepole pines with red crowns that are symptomatic of mountain pine beetle attacks were observed during the aerial surveys of Willmore Wilderness Park.

No MPB-killed trees were observed in 2002 in Cypress Hills Provincial Park.

Ground Surveys

A ground survey was conducted in and around the Town of Canmore and in the Bow Valley Wildland Park following reports of lodgepole pines with red crowns observed by a Conservation Officer. The affected trees were confirmed to have mountain pine beetle attacks. This is the first confirmed report of mountain pine beetle attacks in an area outside Banff National Park during the current outbreak. The ground survey comprised of walk-throughs (recces) to identify the pockets of attack and transect surveys (probes) to mark the trees with mountain pine beetle attacks. Nearly 800 mountain pine beetle-attacked trees were detected in the Bow Valley Wildland Park area (Figure 8). In addition, another 279 infested trees were found at the Grassi Lake area. In ground surveys carried out within the municipal areas, 24 infested trees were found in Canmore and another 91 infested trees were found in the Silvertips Subdivision and the golf course.

During a ground survey that followed the aerial survey, about 200 red-attacked trees and 113 green-attack trees were detected in Willmore Wilderness Park. All the red-attacked trees were cut and the green-attack trees were cut and burned.

[4] Leo Unger, Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, 506 West Burnside Road, Victoria, B.C., personal communication

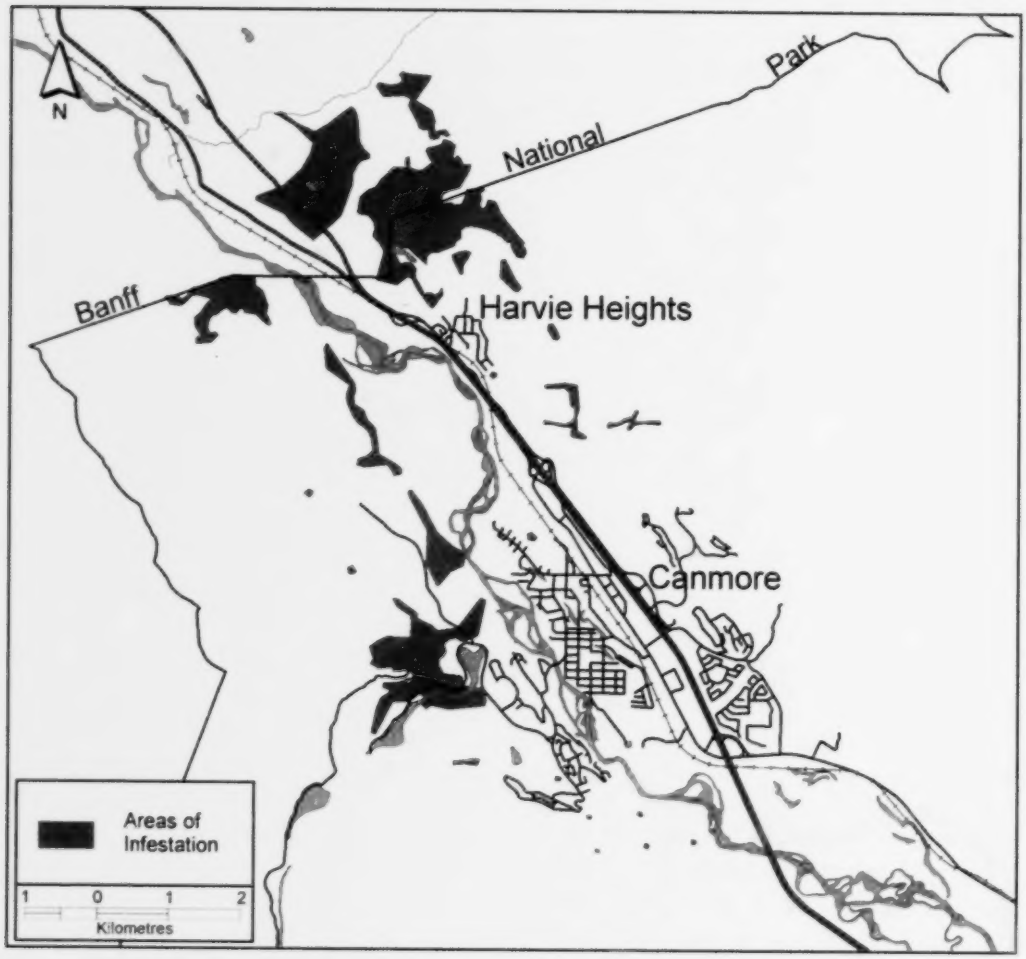


Figure 8. Estimated mountain pine beetle infested areas based on ground survey results in Canmore area of Alberta, 2002.

Survey with Pheromones

A two-component aggregation pheromone bait (Phero Tech Inc., B.C.) was used to monitor MPB presence in high risk lodgepole pine stands in southwestern Alberta; stands near the currently infested areas in Banff National Park were not baited. The procedure for deploying these pheromone baits is described in "Mountain Pine Beetle Management Guide 1999" (Kominek, 1999).

Forty-seven plots with pheromone-baited trees were established to monitor mountain pine beetle activity in southern Alberta. The results of this survey are shown on Figure 6. In the Southern Rockies Corporate Area (SW1), 16 of the 19 plots had beetle hits on baited-trees. The number of hits per tree ranged from 1 to 131. None of the non-baited trees in the vicinity was attacked. These figures support the increasing trend in beetle activity in this corporate area during the past few years. In the Clearwater Corporate Area (SW2) only one out of six plots had trees with beetle hits. Beetle activity in this corporate area has been low in the past few years as well. In the Foothills Corporate Area (SW3), 22 plots were established. Trees in 12 of these plots were not attacked by the beetles. The other ten plots, all located in Willmore Wilderness Park, had beetle hits varying from 1 to 84 per tree. In addition, beetles attacked 13 non-baited trees in the vicinity of four plots. Beetles were removed from six of the attacked trees at the time of inspecting pheromone-baited trees; the other infested trees were cut and burned on November 26 and 27.

In Cypress Hills Provincial Park, mountain pine beetles attacks on pheromone-baited trees were lighter than in 2001[5].

Prevention of Mountain Pine Beetle: Restrictions on Movement of Pine Logs and Products

Ministerial Order 25/2002, prohibited the transportation within Alberta of pine logs and forest products with bark attached, between June 14 and October 1, 2002. Alberta's Forests Act, Timber Management Regulation requires that imported shipments of coniferous logs or forest products with bark attached are accompanied by written authorization from the Minister. Authorizing the importation of specific shipments is based on the product having a low risk of causing or increasing the damage to forest growth by insects or diseases.

[5] Les Weekes, Forest Officer, Alberta Community Development, Cypress Hills Provincial Park, Cypress Hills, Alberta, personal communication

With the assistance of Alberta Transportation - Inspection Services, SRD was able to effectively prevent the importation of unauthorized shipments of pine with bark attached through regular vehicle inspections and random checkstops. From the period between May 1 and October 31 a total of 18 unauthorized shipments were intercepted. All of the shipments originated in British Columbia, and 13 of them were destined for Alberta. The remaining 5 shipments were being transported through Alberta to Saskatchewan, Manitoba, Ontario and Montana.

SPRUCE BEETLE, *Dendroctonus rufipennis* (Kirby)

Several incidences of spruce beetle occurrence have been reported following blow-downs in the NE Corporate Region. These were found either on single trees or on small groups of trees indicating endemic level of populations. Several patches of standing infested trees have been located at several places between Wandering River and May Fire Lookout. A large scale blow-down of spruce found near Amadou Lake will also be inspected for spruce beetle occurrence in 2003.

If unusually mild winter conditions occur in 2003, over-wintering success of spruce beetle is expected to be high in 2003. This will be exacerbated if drought conditions prevail in the spring and summer of 2003. In view of this, mature spruce stands prone to spruce beetle in the NE Corporate Region will be closely monitored in 2003.

YELLOWHEADED SPRUCE SAWFLY, *Pikonema alaskensis* (Rohwer)

The yellowheaded spruce sawfly (YHSS) severely defoliated some young white spruce plantations in the Northeast Corporate Region. Open grown white spruce at oil and gas reclamation sites were particularly vulnerable to this attack. Some plantations suffered up to 40% of tree kill. This insect has been damaging young white spruce in Cypress Hills Provincial Park during the past few years and the infestations continued there in 2002. However, the YHSS damage in this park was less in 2002 compared to 2001.

BROADLEAF PESTS

The extent and severity of aspen defoliation by insect pests was estimated during aerial surveys carried out in the summer. The survey procedures are described in the "Forest Health Aerial Survey Manual" (Ranasinghe and Kominek, 1999). The observers categorize aspen defoliation severity as light (<35% defoliation); moderate (35 – 70% defoliation) or severe (>70% defoliation). Table 3 and Figure 9 show the results of these surveys.

Table 3. The results of aspen pest defoliation surveys in Alberta, 2001 vs. 2002

Corporate Region	Gross area of defoliation (ha)[a]					
	2001			2002		
	Light	Moderate	Severe	Light	Moderate	Severe
Northeast	0	0	0	1489	109 691	15 733
Northwest	141 994	3 044 776	5742	74 165	2 612 780	908 006
Southwest	7207	175 163	142 425	141 324	252 594	83 827
Total		3 517 307			4 199 609	

[a] Gross area of defoliation, i.e., total area covered by the polygons with defoliation

LARGE ASPEN TORTRIX, *Choristoneura conflictana* (Walker)

Forest insects defoliated an estimated gross area of 4 199 609 ha in Alberta in 2002 (Table 3). This is a 19.3% increase in the defoliated area compared to 3 517 307 ha defoliated in 2001. The large aspen tortrix (LAT) continued to be the predominant aspen defoliator in the province.

Northeast Corporate Region

A fixed-wing aircraft was used in July to aerially survey the corporate region for broadleaf defoliator damage. Ground-truthing, where conducted, confirmed that the large aspen tortrix defoliated these stands. In the NE Corporate Region, the gross area defoliated by the LAT was nearly 127 000 ha; in comparison, there was no aspen defoliation in this corporate region in 2001. This defoliation was moderate over an estimated 110 000 ha and was severe over about 16 000 ha. The bulk of the defoliation was observed west of the Athabasca River between townships 88 and 97 extending eastwards to range 19 west of the 4th meridian. One patch of severe defoliation (1104 ha) was found on the eastern slopes of Birch Mountain as far north as township 103 and range 12. Two patches of severe defoliation covering 3154 ha and 1355 ha respectively, were observed in the Gordon Lake area east of the Athabasca River (Figure 9).

Figure 9. The results of aspen pest defoliation surveys in Alberta, 2002.

Northwest Corporate Region

A fixed-wing aircraft (Cessna 210) was used in July and August to carry out overview aerial surveys on aspen defoliation in the NW Corporate Region. A follow-up ground truthing survey indicated that the LAT caused most of the aspen defoliation in this corporate region. The area defoliated by the LAT in the NW Corporate Region in 2002 increased marginally (13%) compared to the area defoliated in 2001; however, the severely LAT-defoliated area in this corporate region increased dramatically (157-fold). Areas of severe defoliation were recorded in Fort Vermillion, John D'or Indian Reserve, Chinchaga Fire Lookout Tower, and Sulphur Lake areas. Moderate aspen defoliation was recorded in Chipweyan Lakes, Peerless Lake, Cadotte Lake, Keg River, south of Grande Prairie and south of High Prairie. The eastward movement of LAT infestation in this corporate region continued in 2002.

Southwest Corporate Region

Overall, 477 745 ha were defoliated by aspen defoliators in the SW Corporate Region. This is a 47% increase in the gross defoliated area compared to 324 795 ha defoliated in 2001 (Table 3 and Figure 9). There was a noticeable increase in the forest tent caterpillar defoliation and some decrease in the LAT defoliation in 2002 in the southern section of this Corporate Region. Most of this defoliation was of moderate severity. In the northern section of the SW Corporate Region (SW3 and SW4) a gross area of 262 659 ha was defoliated. Most (58%) of this defoliation was moderate; nearly 41% of the defoliation was light and only about 1% was severe.

FOREST TENT CATERPILLAR, *Malacosoma disstria* Hübner

In 2002, the forest tent caterpillar (FTC) defoliated nearly 70 000 ha in the southern section of the SW Corporate Region; there was no forest tent caterpillar defoliation detected in the northern section of this Corporate Region. Although some forest tent caterpillar larvae and defoliation were observed during the ground surveys in the NW Corporate Region, the damage caused by the FTC and LAT was indistinguishable and was ascribed to the predominant defoliator, the large aspen tortrix. There was no forest tent caterpillar defoliation in 2002 in the NE Corporate Region.

In the NE Corporate Region, traps baited with pheromone lures (Phero Tech Inc., B.C.) were deployed in 20 plots to monitor the forest tent caterpillar moth populations. Of these plots five were located around Calling Lake and the Alberta-Pacific Mill, seven were located near Lac La Biche and eight were located near Cold Lake. At one plot, both traps were disturbed by bears. The trap catch in the other 19 plots varied from 5–131 moths per trap. The average trap catch (41 moths per trap) in 2002 is lower than the average trap catch (68 moths per trap) in 2001. There was no defoliation in any of the plots.

GYPSY MOTH, *Lymantria dispar* (Linnaeus)

Reports of increased gypsy moth population levels in 2002 in eastern Canada and in the U.S. prompted a higher state of gypsy moth alert in Alberta. The Land and Forest Division of Sustainable Resource Development set up 75 traps as a part of the annual gypsy moth survey

conducted by the Canadian Food Inspection Agency (CFIA). Delta traps baited with "dispalure" were used in this survey. No gypsy moths were caught in the traps that were deployed in July-August throughout the forested Crown land of the province. However, in 2002 one gypsy moth was trapped in Alberta by another agency working under the CFIA program.

SMALLER EUROPEAN ELM BARK BEETLE, *Scolytus multistriatus* (Marsham)

The smaller European elm bark beetle (SEEBB), a vector of Dutch elm disease, has been found recurrently in Calgary since 1994; in Edmonton since 1995; and in Medicine Hat since 1998. This beetle has been trapped in the past near Balzac, in Coutts, High River, Killam, Lethbridge, Lloydminster, Red Deer, St. Albert, Strathcona County, Taber, Vauxhall, and in Wainright.

Sticky panel traps baited with the pheromones (209) were placed in 128 municipalities, 52 provincial and municipal parks and 29 nurseries. In 2002, the number of SEEBB trapped in pheromone-baited traps declined compared to the previous years. One beetle was trapped in Edmonton and one in Lloydminster and eight in Calgary. The trap catches over the years suggest the presence of endemic SEEBB populations in Alberta. However, there is still no conclusive evidence of their establishment, i.e., SEEBB galleries with live beetle larvae in elm in Alberta.

No native elm bark beetles, *Hylurgopinus rufipes* (Eichoff), have been trapped in Alberta under this program.

OTHER NOTEWORTHY PESTS

DUTCH ELM DISEASE (DED), *Ophiostoma ulmi* (Buis.) Nannf. and *O. novo-ulmi* Brasier

In spite of having a relatively large American elm population, Alberta still remains free of Dutch elm disease (DED). To date the only confirmed record of DED in Alberta was from samples collected in 1998 from an elm tree in Wainwright. No new cases of DED were reported in 2002 in Alberta.

In 2002, the Society to Prevent Dutch Elm Disease (STOPDED) monitored municipalities, provincial or municipal parks, plant nurseries, and all of the ports-of-entry at Alberta–Montana border for one of the vector species of this disease, the smaller European elm bark beetle (SEEBB). Large volume of elm firewood was also confiscated at the Alberta-Montana ports-of-entry.

For further details about DED in Alberta, please visit the web site: www.agric.gov.ab.ca/navigation/pests/trees/index.html

DOTHIORELLA WILT DISEASE OF ELM, *Dothiorella ulmi* Verall & May

Since 1996, a vascular wilt disease caused by the fungus, *Dothiorella ulmi*, has affected American elm trees growing in Edmonton. This disease results in progressive die back and eventual tree mortality. In 2002, another 100 elms with wilt symptoms were observed in the city; another five

trees with wilting were found outside Edmonton. Samples from all these wilted trees were submitted to the University of Alberta's plant pathology laboratory, which confirmed Dothiorella Wilt on 23 of the samples. Together with the six confirmed cases in Edmonton in 2001, this disease has affected over 200 elms in the city since 1996. Areas with high elm density appear to be more prone to this disease. Radical pruning of affected branches as well as nearby healthy - looking branches at early stages of the disease, appears to be effective in controlling it. Once the disease symptoms are well established and are closer to the main stem, pruning has no effect. To date 74 of the infected trees located in Edmonton have been removed.

GRAY WILLOW LEAF BEETLE, *Tricholohcmaea decora* (Say)

In 2002, the gray willow leaf beetle defoliated vast swaths of willow in the NE Corporate Region. The extent of defoliation was not mapped. It was more extensive than in 2001 when this beetle defoliated willow stands in the northern part of the corporate region.

ASH LEAF CONE CATERPILLAR, *Caloptila fraxinella* (Ely)

Ash leaf cone caterpillar (ALCC) was first reported in Edmonton in 1999. In July 2002, similar damage was reported from ash trees growing around Wandering River Ranger Station and in Fort McMurray in the NE Corporate Region. Chris Saunders (City of Edmonton) confirmed the ALCC as the cause of this damage.

This pest is known to attack ash as well as lilac trees. The young larvae feed on the leaf surface and the mature larvae roll the leaves into a characteristic cone-shape. However, the ALCC damage is cosmetic and does not cause long term effects. Moreover, this insect is susceptible to many natural enemies such as parasitic wasps and it is unlikely to become a serious pest.

RED ELM WEEVIL, *Magdalis amicollis* (Say)

The red elm weevil, *Magdalis armicollis* (Say), damage was reported on elm trees growing in Lethbridge and surrounding areas. The drought conditions in these areas exacerbated weevil damage on elm trees.

INVASIVE PLANT MANAGEMENT

PROVINCIAL

The Forest Health Program is responsible for managing non-native invasive plants (noxious and restricted weeds) in the forested area of the province. These plants, most of which are designated as restricted, noxious or nuisance weeds under Alberta's Weed Control Act, deem to pose a threat to the natural ecosystems and economy of the province. Strategies to manage invasive plants include:

- inventory surveying to prioritize species or areas for control;
- multiple control techniques;
- co-operative management; and,
- preventing infestations by promoting awareness through education.

Provincially, this program focuses on continued development of co-operative relationships among stakeholders and landowners. The stakeholders include provincial and municipal governments and industry (forest industry, oil and gas industry and livestock holders). This approach, over the long-term, enables more effective and efficient management of invasive plants at a landscape level. This year, much progress has been made in this regard and the details are included in the regional information that follows.

REGIONAL

NORTHEAST CORPORATE REGION

Education, Awareness and Co-operative Initiatives

A priority for the Northeast Corporate Region's invasive plant management program in 2002 was to increase awareness about these plants. The distribution of posters and plant identification booklets to increase invasive plant awareness was successfully carried out in 2002. However, the commitments to hold identification workshops and present invasive plant information could not be fully implemented. Presentations on invasive plant management were made at each of the working group meetings described below.

The Northeast Regional Co-operative Weed Management Working Group met twice this year in Athabasca —once in April and again in November. These meetings continued to generate a positive response from the group members and have provided open forums where participants have actively discussed invasive plant management issues. A second co-operative group was established this year in Fort McMurray and its first meeting was held in December.

Surveys and Control

This season, 781 sites were surveyed for invasive plants in the Northeast Corporate Region. Of the 781 surveys, Land and Forest Division completed 688 and stakeholders submitted 93. This

equates to a 42% increase in the number of surveys completed by Land and Forest Division. Of the sites inventoried in 2002, 49% were land-use dispositions, 19% were timber dispositions and cutblocks, and 32% were other sites (Government facilities and vacant Crown land). Invasive plant infestations were noted on 62% of the 688 sites surveyed this season by Land and Forest Division. The degree of infestation varied from trace (35%) to low (37%) for the majority of the infestations identified, with 17% of the infestations being moderate and the remaining 11% categorized as being high. The highest percentage infestation occurred in land dispositions where 73% of the inventoried sites were infested. In comparison, only 51% of the timber dispositions and other sites inventoried were infested. The degree of infestations in cutblocks inventoried varied from trace to moderate with no cutblocks having a high degree of infestation. Most of the infestations in cutblocks were concentrated at the access points of the blocks and were less than one hectare in size. The frequency of occurrence of the invasive plant species encountered in the surveys is given below:

Common Name	Scientific Name	Frequency
Scentless chamomile	*Matricaria perforata*	30%
Perennial sow-thistle	*Sonchus arvensis*	25%
Canada thistle	*Cirsium arvense*	18%
Common tansy	*Tanacetum vulgare*	12%
Tall buttercup	*Ranunculus acris*	12%
Ox-eye daisy	*Chrysanthemum leucanthemum*	2%
Other spp.		1%

There were no restricted weed species identified this year by the Land and Forest Division.

NORTHWEST CORPORATE REGION

Invasive plant management programs were implemented this year within the forested Crown land of the Smoky and Peace corporate areas. These programs consisted of inventory surveys, education and awareness, and controlling of various invasive plant species.

Education, Awareness and Co-operative Initiatives

Co-operative management working groups were established this fall in the Smoky and Peace corporate areas. Participants included stakeholders from various government and industry groups. Improving the efficiency and effectiveness of invasive plant management is the main focus of the groups. The groups will strive to develop a single, consistent approach to invasive plant management for all stakeholders involved.

In the Peace Corporate Area, co-operative management programs between Land and Forest Division, Municipal District of Clear Hills, Municipal District of Northern Lights and Northern Sunrise County were continued. These programs focused mainly on inventory surveys but also included some training and awareness and control projects for scentless chamomile.

A training and awareness meeting was held in Fairview in May for interested forestry, oil and gas, spray contractors, railway and government stakeholders within the Smoky, Lesser Slave, Peace and Upper Hay corporate areas.

Surveys and Control

In the Smoky Corporate Area, projects included herbicide application to control Canada thistle (*Cirsium arvense*) infestations north of the LaValley grazing lease on vacant Crown land, within the Dobbyn grazing lease and within the Blueberry Mountain Community Forest. Scentless chamomile (*Matricaria perforata*) was hand-picked along the Simonette River near Spring Creek in a joint project between Land and Forest Division and the Municipal District of Greenview. One-hectare infestation of scentless chamomile was also sprayed with herbicide in a public gravel pit southeast of Grande Prairie. A small common tansy (*Tanacetum vulgare*) infestation was sprayed with herbicide at the Two Lakes Fire Base.

Under the co-operative program with the Municipal District of Clear Hills and Municipal District of Northern Lights, scentless chamomile was hand-picked and sprayed with herbicide at various locations along the Chinchaga Forestry Road corridor and in the Keg River Area. Within the Municipal District of Clear Hills, inspections revealed a reduction in previously identified scentless chamomile sites due to previous successful control projects. Inspections also revealed that the number of common tansy sites had increased slightly in the Municipal District.

Through a co-operative initiative with Northern Sunrise County, 47 sites were inspected within the forested area of the county this year. Results from the survey indicate that scentless chamomile was found at the majority of infested sites. Two scentless chamomile infestations were hand-picked near Little Buffalo located in Sec.14-Twp.86-Rge.13-W5. As well, biological control for scentless chamomile was implemented this year. A small number of scentless chamomile gall midges (*Rhopalomyia spp.*) were released within an infested area in Sec.12-Twp 91-Rge.13-W5 near Haig Lake. This release area and others will be monitored next year to evaluate the success of gall midge establishment and scentless chamomile control.

Spotted knapweed has been reported within British Columbia near the Alberta border in the Northwest Corporate Region. Roads and lease sites near this area will be a priority for inspections in 2003.

SOUTHWEST CORPORATE REGION (SW1 and SW2 Areas)

Education, Awareness and Co-operative Initiatives

The establishment of invasive plant co-operative management groups was the primary goal of the 2002 season. Several meetings were held in the corporate region with many stakeholders and disposition holders. The goal of the co-operative groups is to design an invasive plant management program to achieve the following objectives:

- Cost effective invasive plant control;
- Control of invasive plants as per Alberta's Weed Control Act - proactive approach regarding awareness, control, and enforcement measures;
- Understanding technical aspects of invasive plant management;
- Efficient invasive plant management either by lobbying or becoming involved with neighbouring stakeholders;
- Effective and efficient control through improvement of knowledge base;
- Long-term management plans; and,
- Public Awareness and education.

A working relationship with all Counties/Municipal Districts has been established for the last several years. There has been ongoing communication between Land and Forest Division and the major disposition holders such as Atlas Lumber, Devon Energy (Northstar), Shell Oil, Altalink, and Transcanada Pipelines. This co-operation greatly assisted with recording invasive plant history, inventory, and implementing control measures on their leases.

The co-operative management group strategy was introduced to grazing and timber permit-holders/lease-holders. An informative letter package asked them to complete an inventory sheet and report invasive plant locations to Land and Forest Division. Each group also received a page outlining prevention practices; one geared for ranching, and the other for timber harvesting operations. Timber operators also received an information sheet on wild caraway (*Carum carvi*). A copy of the booklet Weed Identification in Alberta was made available for the timber permit holders.

All of the remaining industry disposition holders were contacted by phone individually and asked what invasive plant management programs the company employs; how it is budgeted for; the level of identification knowledge among field staff; whom did they contract for spraying; and, how long has the same operator been used. All were encouraged to contribute to the inventory and copies of the identification booklet were offered. All were aware of their management responsibilities but the strength of their invasive plant management plans varied widely.

The Bow Corporate Area overlaps the Municipal District of Bighorn and the Kananaskis Improvement District, and borders the Municipal District of Rocky View, and Mountain View and Clearwater counties. This is the first year that co-operative initiatives have been pursued in the Bow Corporate Area. In the spring, meetings were held with the Municipal Districts of Bighorn and Rocky View, Mountain View County and the Kananaskis Improvement District. All were receptive to the idea of a comprehensive invasive plant inventory and working together when possible. A wrap-up conference call was held in October to inform the Municipal Districts/Counties on the invasive plant co-ordinators' seasonal progress and to discuss priorities and opportunities for collaboration in 2003.

Surveys and Control

Within the Municipal Districts of Ranchlands and Pincher Creek, the designation of blueweed (*Echium vulgare*) has been elevated to restricted and common mullein (*Verbascum thapsus*) is

regarded as noxious. Common burdock (*Arctium minus*) is regarded as noxious in the Municipal District of Ranchlands. Clearwater County has upgraded the designation of wild caraway (*Carum carvi*) to noxious, and as of October 2002, the Municipal District of Bighorn was doing the same.

In the Porcupine Hills Forest Reserve the most serious invasive plant infestations are concentrated in the southeastern section and lie mostly within the Municipal District of Willow Creek. This corner of the Forest Reserve has widespread and growing infestations of hound's-tongue (*Cynoglossum officinale*) and common burdock. These invasive plants are a serious concern on rangeland because of their ill effects on livestock. Because seed stuck in livestock fur/hair is the primary means of spread for these two species, the result is a rapid and wide spread across grazing range. Agricultural areas to the south and east of the Porcupine Hills are also infested with these invasive plants.

The remainder of the Porcupine Hills has widely scattered, small infestations of ox-eye daisy (*Chrysanthemum leucanthemum*) and Canada thistle (*Cirsium arvense*). A few isolated hound's-tongue plants have appeared west of the fifth meridian, signalling this plant's spread westward. This area is treated annually by the Municipal District of Ranchlands as part of Land and Forest Division's agreement with them.

Canada thistle is continuous along the Beaver Creek Road and the Municipal District of Willow Creek applied herbicide to control these plants in late August. A more co-operative effort between Land and Forest Division and Municipal District of Willow Creek will need to be pursued in 2003 to gain more complete control of this infestation.

South of the Crowsnest Pass, the Sartoris Road beginning in the town of Blairmore was solidly infested with ox-eye daisy along its ditches for several kilometres into the forest area. Tall buttercup (*Ranunculus acris*) has spread along the ditches as well this year. A few spots of common toadflax persist despite repeated treatment. Adanac Road is accessed through the community of Hillcrest and was infested with dalmatian toadflax (*Linaria dalmatica*) and blueweed this year. Spotty ox-eye daisy patches exist, and hound's-tongue is beginning to appear.

Herbicide application continued to a lesser extent this year in the Jumping Pound/Sibbald area of the Bow Corporate Area. Field scabious (*Knautia arvensis*) has been an ongoing problem in the area. Additional herbicide application took place in the Sibbald campground and Husky Energy's Moose Mountain road, but was billed to the appropriate parties – this is the first collaborative control initiative for this area.

On the Sibbald Flats, annual herbicide application has achieved fairly good control of field scabious; however, on the north side of the creek and others areas accessible only by all-terrain vehicle or foot remain badly infested.

SOUTHWEST CORPORATE REGION (SW3 and SW4 AREAS)

Education, Awareness and Co-operative Initiatives

An invasive plant awareness workshop was held in Whitecourt in April. The objectives of the workshop were plant identification, legislation regarding control, prevention, and various control methods. This workshop was attended by 47 individuals representing 35 organizations.

Several years ago Land and Forest Division, Yellowhead County, Woodlands County, and the Municipal District of Greenview designed an invasive plant identification pamphlet. This pamphlet was updated and reprinted by the contributors.

Surveys and Control

Herbicide application to control invasive plants occurred in Carson Pegasus Provincial Park. A spray efficacy survey was completed at the site to monitor the success of the application. Herbicides were used to control the invasive plants at the Greg River Day Use Area, Rock Lake Staging Area, Watson Creek Campground, and several areas in William A. Switzer Park. Three infested sites, two in Huestis Demonstration Forest and one by Losegun Lake, were located too close to water to spray with herbicide and were instead hand-picked in co-operation with the Junior Forest Rangers. Control by handpicking also occurred at the Whitehorse Creek Campground and Staging Area.

This year Land and Forest Division entered into a contract with Yellowhead County for inventory and control services in the forested area of the county. This contract was successful and will be considered again for the 2003 season if needed.

Two biological control insects were released in the Foothills Corporate Area in 2001. The scentless chamomile gall midge (*Rhopalomyia* spp.) and the seed pod weevil (*Omphalapion hookeri*) were both released at two sites. Recent observations indicate the gall midge establishment was unsuccessful, however, the seed pod weevil established at both sites. One site where weevil establishment was very successful may be used as a collection site for further releases.

INCREASED AWARENESS AND TRAINING

PROVINCIAL

INCREASED AWARENESS

Bugs and Disease Newsletter

The Forest Health Section publishes a tri-annual newsletter entitled "Bugs and Diseases" Info Note. This publication carries updates on the Forest Health Program, pest information and other forest pest-related news of interest. In 2002, three issues of this Newsletter were published and distributed across Canada. This publication is also available on-line now at the Forest Health website.

Forest Health Website

In 2002, the Forest Health Section launched a new and improved website (www3.gov.ab.ca/srd/forests/health/). This website contains information about forest insects and diseases; cone and seed pests; exotic pests and invasive plants. It also has information on the latest forest health conditions and maps; survey data; and, publications and directives that can be viewed and downloaded in many cases. There is a pest alert section on forest pests that pose a serious threat to Alberta's forests, such as mountain pine beetle and gypsy moth. Check this website for the latest updates.

Posters and Brochures

The Forest Health Section, in collaboration with the Communication Division of the Department of Sustainable Resource Development, updated and published an informative poster on the mountain pine beetle. This was accompanied by a brochure on the mountain pine beetle. Both of these publications are available, free of charge, from the Information Centre, Main Floor, Great West Life Building, 9920 – 108 Street, Edmonton, AB, T5K 2M4 (Telephone (780) 422-2079); these are also available on the Forest Health website.

Alberta Sustainable Resource Development in partnership with other government and industry stakeholders contributed to the development of the brochure "Cutting Costs With Weed Prevention." This brochure includes information on weed impacts, legal responsibilities of disposition holders and landowners, informative references, and prevention tactics essential to limit the introduction and spread of weeds. This publication is available, free of charge, from the Information Centre, Main Floor, Great West Life Building, 9920 - 108 Street, Edmonton, AB, T5K 2M4 (Telephone (780) 422-2079).

Highway Signs

In collaboration with the STOPDED, and Alberta Transportation, the Forest Health Section of

SRD was instrumental in getting combine highway signs erected to warn the general public against bringing wood with bark into Alberta. Altogether, 42 large signs were posted at 21 highway border crossings along Alberta's borders with the neighbouring provinces and Montana. These signs are meant to help in keeping either mountain pine beetle- or small European elm bark beetle-infested wood from entering into Alberta.

Forest Pest Damage Diagnostic System

In 2002, this system was re-evaluated to produce a web-based diagnostic system. Once the system is web-based, it will offer more flexibility and choices to the user. The added features include search by forest pest damage code or host tree, and comparison of pests. The initial programming has been carried out. Data are now being entered to complete the "Flash Version" of this product.

RESEARCH AND DEVELOPMENT

FIELD TRIALS

WOOD BORER STUDY

Wood borer damage was prevalent in the aftermath of the large-scale forest fire experienced in 2002 in the NE Corporate Region. Forest fire-killed trees are also susceptible to checking, i.e., splitting of wood due to differential drying of the dead wood. Both of these phenomena result in loss of quality of salvaged wood. When prioritizing the harvest areas, one of the questions the forest manager has to address in scheduling a fire salvage operation is the impact of wood borer vs. checking damage.

In 2002, the Forest Health Section initiated a two-year field trial in the NE Corporate Region to compare the incidence and impact of wood borer vs. checking damage in fire-killed timber. Lindgren funnel traps baited with wood borer pheromones (Phero Tech Inc. B.C.) were used to detect the incidence and type of wood borers in the study area. Three one-ha blocks each representing a light, moderate or a severe burn were selected in the burned area. Four plots were laid out in each block. The height, diameter at breast height (dbh) and wood borer incidence on each conifer tree in these plots were recorded. In addition the trees earmarked for detailed sampling were also demarcated.

Half of these trees will be harvested in 2003 winter and the logs from each plot will be piled separately in a mill yard. Once the pre-selected trees have been sampled, the logs will be cut to merchantable sizes and debarked to assess the incidence of wood borer and checking. Later the logs will be processed at a small sawmill and graded based on the 'worm-holes' and checking damage. This process will be repeated for the other half of the trees in the plots in next winter.

REFERENCES

Feddes-Calpas, J., 2002. Alberta's Dutch elm disease prevention program report for 2001. Unpublished report. Alberta Agriculture, Food and Rural Development, Edmonton, AB.

Kominek, C., 1999. Mountain pine beetle management guide: A revisable manual. Alberta Environment, Forest Health Branch, Edmonton, AB.

Ranasinghe, S.K. and Kominek, C., 1998. Spruce budworm management guide. A revisable manual. Alberta Environmental Protection, Forest Health Branch, Edmonton, AB.

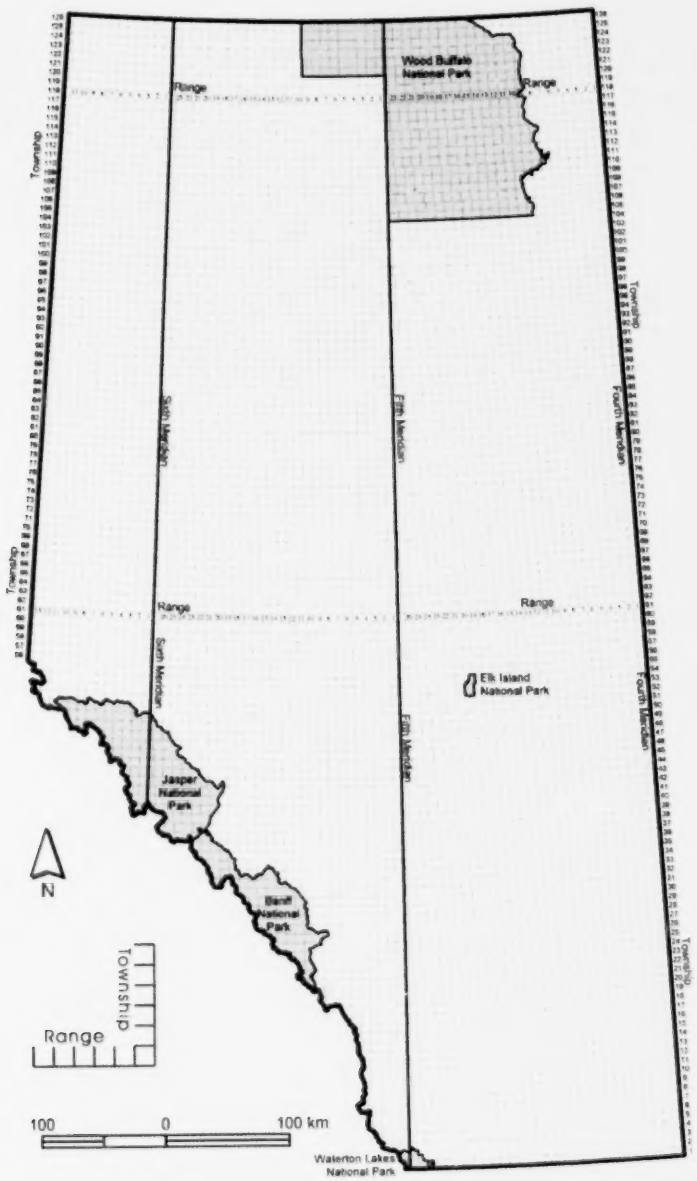
Ranasinghe, S.K., and Kominek, C., 1999. Forest health aerial survey manual. A revisable manual. Alberta Environment, Forest Health Branch, Edmonton, AB.

Saunders, C., 2002. Urban forest insect and disease report. Unpublished report. Community Services, City of Edmonton, AB.

APPENDIXES

APPENDIX I

ALBERTA TOWNSHIP SYSTEM



APPENDIX II

INFORMATION ON OPERATIONAL USE OF PHEROMONES IN ALBERTA, 2002

FOREST TENT CATERPILLAR

Chemical component(s):	Z5, E7 – dodecadienal
Lure type:	Flexlure®
Trap type:	Uni-trap®
Pheromone source:	Phero Tech Inc., Delta, British Columbia

GYPSY MOTH

Chemical component(s):	(+)cis-7, 8-epoxy-2-methyloctadecane
Lure type:	Disparlure®
Trap:	Delta sticky trap
Pheromone source:	Trécé Inc., Salinas, California (purchased and distributed by Canadian Food Inspection Agency)

MOUNTAIN PINE BEETLE

Chemical component(s):	trans-verbenol, exo-brevicomin
Lure type:	Pre-packed tree-bait
Trap:	not applicable
Pheromone source:	Phero Tech Inc., Delta, British Columbia

SPRUCE BUDWORM

Chemical component(s):	95% E-11-tetradecenal, 5% Z-11-tetradecenal
Lure type:	Biolure®
Trap type:	Multi-Pher I®
Pheromone source:	Consep Inc. (purchased and distributed by Natural Resources Canada, Sault Ste Marie, Ontario)